

§103 Rejection of the Claims

The Examiner has the burden under 35 U.S.C. § 103 to establish a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). To do that the Examiner must show that some objective teaching in the prior art or some knowledge generally available to one of ordinary skill in the art would lead an individual to combine the relevant teaching of the references. *Id.*

The *Fine* court stated that:

Obviousness is tested by "what the combined teaching of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 878 (CCPA 1981)). But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." *ACS Hosp. Sys.*, 732 F.2d at 1577, 221 USPQ at 933. And "teachings of references can be combined *only* if there is some suggestion or incentive to do so." *Id.* (emphasis in original).

The M.P.E.P. adopts this line of reasoning, stating that

In order for the Examiner to establish a *prima facie* case of obviousness, three base criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *M.P.E.P.* § 2142 (citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)).

An invention can be obvious even though the suggestion to combine prior art teachings is not found in a specific reference. *In re Oetiker*, 24 USPQ2d 1443 (Fed. Cir. 1992). At the same time, however, although it is not necessary that the cited references or prior art specifically suggest making the combination, there must be some teaching somewhere which provides the suggestion or motivation to combine prior art teachings and applies that combination to solve the same or similar problem which the claimed invention addresses. One of ordinary skill in the art will be presumed to know of any such teaching. (See, e.g., *In re Nilssen*, 851 F.2d 1401, 1403, 7

USPQ2d 1500, 1502 (Fed. Cir. 1988) and *In re Wood*, 599 F.2d 1032, 1037, 202 USPQ 171, 174 (CCPA 1979)).

Applicant respectfully submits that the Office Action did not make out a *prima facie* case of obviousness because the cited references fail to teach or suggest all of the elements of applicant's claimed invention.

1. Claims 39, 42, 48 and 51

Claims 39, 42, 48, and 51 were rejected under 35 USC § 103(a) as being unpatentable over Kanber (U.S. Patent No. 5,312,765) in view of Chino et al. (U.S. Patent No. 5,796,714).

Kanber discloses a method of fabricating a three-dimensional gallium arsenide microelectronic device. In the embodiment cited by the Examiner, which is discussed in column 6, lines 35-44 and illustrated in FIG. 12, hollow vias (92) are formed in the substrate. However, contrary to the Examiner's statement in section 3 on page 2 of the latest Office Action, the hollow vias (92) are *not* used to interconnect first and second functional circuits. Rather, quoting the specification in column 6, lines 38-40: "Hollow vias 92 may be formed through the substrate 10 to enable an optical pattern to be incident on the devices 16 as indicated by arrows 94."

It is clear from this description and from FIG. 12 that the "optical pattern," as indicated by arrows 94, originates from outside the device structure 84, and not from a device on the substrate (10). Thus, Kanber does not teach or suggest the limitation in Applicant's claimed invention of interconnecting first and second functional circuits on the substrate via an optical fiber formed through the substrate.

Further, the Examiner states that Chino et al. teaches in column 12, lines 36-60 "an analogous method to form integrated circuits including the steps of forming a hole (121) in a substrate (12) having a cladding layer (125) and a hole (125) in the hole (121) suitable for interconnections."

A careful reading of the cited passage of Chino et al. and a close examination of the corresponding FIG. 8 reveals that Chino et al. has nothing to do with forming an optical fiber in a hole passing through a substrate, and is not particularly relevant to Applicant's claimed invention.

Chino et al. is directed to coupling a vertical cavity surface emitting laser (VCSEL) to a pre-existing optical fiber. Groove (121) (which is *not* a hole) is formed merely as a guide for aligning the optical fiber to the VCSEL. The latter emits radiation directly through a portion of the substrate and into the optical fiber. Further, Chino et al. has nothing to do with interconnecting two separate functional circuits residing on a single substrate by passing light through the substrate, as is claimed in applicant's invention. Rather, the role of the optical fiber in Chino et al. is to carry light *away* from the substrate, not to relay the light *through* the substrate. Communication with another device on the substrate is accomplished in Chino et al. in the conventional way, i.e., by connecting the external optical fiber (123) to another functional device on the substrate by passing the fiber *around* the substrate.

The combination of Kanber and Chino et al. fails to teach or suggest all the limitations of the invention as claimed in claims 39, 42, 48 and 51. In particular, there is no teaching or suggestion in either reference of interconnecting first and second circuits together via an optical fiber formed through the substrate.

Accordingly, applicant respectfully submits that a *prima facie* case for obviousness has not been established with respect to claims 39, 42, 48 and 51. Applicant therefore respectfully requests withdrawal of the rejection of the claims and the allowance of the claims.

2. Claims 41, 43, 44 and 50

Claims 41, 43, 44, and 50 were rejected under 35 USC § 103(a) as being unpatentable over Kanber and Chino et al. as applied to claims 39, 42, 48, and 51 above, and further in view of Gaul (U.S. Patent No. 5,618,752).

Claims 41, 43 and 44 depend from claim 39, and claim 50 depends from claim 48. As discussed above, the application of Kanber and Chino et al. to independent claims 39 and 48 fails to establish a *prima facie* case of obviousness for these claims. The citation of Gaul to cover the limitations found in dependent claims 41, 43, 44 and 50 is moot because a *prima facie* case has not been made with respect to the corresponding independent base claims.

Applicant therefore respectfully requests withdrawal of the rejection of claims 41, 43, 44 and 50, and the allowance of same.

3. Claims 45, 46, 52 and 53

Claims 45, 46, 52, and 53 were rejected under 35 USC § 103(a) as being unpatentable over Kanber in view of Chino et al. as applied to claims 39, 42, 48, and 51 above, and further in view of Gaul and Suzuki (U.S. Patent No. 5,362,976).

Claim 45 depends from independent claim 39, and claim 46 depends from claim 45. Further, claim 52 depends from independent claim 48, and claim 53 depends from claim 52.

As discussed above, Kanber and Chino et al. as applied to independent claims 39 and 48 fails to establish a *prima facie* case of obviousness with respect to these claims. Thus, the citation of Gaul and Suzuki for covering the limitations of the abovementioned dependent claims is moot because a *prima facie* case has not been made with respect to the corresponding independent base claims.

Accordingly, Applicant therefore respectfully requests withdrawal of the rejection of claims 45, 46, 52 and 53, and the allowance of same.

4. Claims 55, 57, 58, 62, 67 and 68

Claims 55, 57, 58, 62, 67, and 68 were rejected under 35 USC § 103(a) as being unpatentable over Gaul in view of Chino et al. and Kanber.

Gaul teaches the formation of an *electrical* via (215) for providing *electrical* contact between a circuit region (214) on one side of a wafer and an metal contact (222) on the other side of the wafer. See, e.g., Column 7, line 31 to column 8, line 34, and FIGS. 2A-2D. Note, element (222) is *not* a functional circuit, as stated in section (6), page 5 of the Office Action. Rather, element (222) is a metal contact present to conduct an *electrical* signal passing through the *electrical* via (215).

In Gaul, the only discussion of providing optical communication through a wafer is provided in column 11, lines 35-60 and in FIG. 5. In FIG. 5, an optical via (344) is formed in a first wafer 342 that allows for a transmitter (346) on a second spaced-apart wafer (341) to communicate to a detector (345) located on a third spaced-apart wafer (343). In contrast, the claimed invention involves two wafers bonded together.

Chino et al. is cited for teaching providing a hole with a cladding and a substrate. However, as discussed above, Chino et al. only teaches coupling a pre-existing optical fiber with a VCSEL by using a guiding groove to ensure alignment of the fiber with the VCSEL. Thus, the citation of Chino et al. is misguided because it has nothing to do with forming an optical fiber in a hole formed through a substrate.

The Office Action states on page 6, third paragraph, that Gaul in view of Chino et al. does not teach interconnecting the first and second circuits together via an optical fiber. Assuming *arguendo* that this is the only shortcoming of the combined references (and Applicant would like to emphasize that this is decidedly not the case), the citation of Kanber for optically interconnecting first and second function circuits through a substrate fails because it is simply incorrect. Nowhere in Kanber is there a teaching of optically interconnecting first and second functional circuits on different surfaces of bonded substrates, as is claimed in Applicant's invention.

In sum, the combination of Gaul in view of Chino et al. and Kanber fails to teach or suggest all of the limitations of claims 55, 57, 58, 62, 67, and 68. In particular, the combination fails to teach or suggest the limitation in claims 55, 57 and 58 that first and second functional circuits on respective first and second bonded substrates be interconnected via an optical fiber formed through the first substrate. Likewise, the combination fails to teach or suggest the limitation in claims 62, 67 and 68 that the first and second functional circuits on respective first and second bonded substrates be interconnected via an optical fiber formed through the first and second substrates.

Notwithstanding the fact that the combination of Gaul, Chino et al. and Kanber does not yield Applicant's invention, there is absolutely no motivation to combine these references. Gaul is directed ostensibly to electrical vias, and the one optical via embodiment disclosed therein involves communicating between three separated, unbonded wafers. Chino et al. has nothing to do with forming optical fibers in holes in substrates and is irrelevant to Applicant's invention. Finally, the teaching of Kanber is limited to a single device receiving light through a hole in a substrate.

Accordingly, applicant respectfully submits that a *prima facie* case for obviousness has not been established with respect to claims 55, 57, 58, 62, 67, and 68. Applicant therefore respectfully requests withdrawal of the rejection of the claims and the allowance of same.

5. Claims 59, 60, 64, 65, 70 and 71

Claims 59, 60, 64, 65, 70, and 71 were rejected under 35 USC § 103(a) as being unpatentable over Gaul in view of Kanber and Chino et al. as applied to claims 55, 57, 58, 62, 67, and 68 above, and further in view of Suzuki.

Claims 59 and 60 depend from independent claim 55, claims 64 and 65 depend from claim 62, and claims 70 and 71 depend from claim 68. As discussed above, the application of Gaul in view of Kanber and Chino et al. to independent claims 55, 52 and 68 fails to establish a *prima facie* case of obviousness with respect to these claims. The citation of Suzuki to cover the limitations found in dependent claims 59, 60, 64, 65, 70 and 71 is moot because a *prima facie* case has not been made with respect to the corresponding independent base claims.

Accordingly, Applicant therefore respectfully requests withdrawal of the rejection of claims 59, 60, 64, 65, 70, and 71, and the allowance of same.

Allowable Subject Matter

Claims 40, 47, 49, 54, 56, 61, 63, 66, 67, 69, and 72 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicant believes all the claims are allowable as presented for the reasons provided above.

AMENDMENT AND RESPONSE UNDER 37 CFR § 1.111

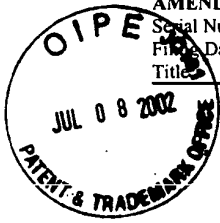
Serial Number: 09/650,569

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Title: METHOD OF FORMING AN OPTICAL FIBER INTERCONNECT THROUGH A SEMICONDUCTOR WAFER

Page 8

Dkt: 303.390US3



CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney, Joe Gortych, at (802) 660-7199 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

JOSEPH E. GEUSIC ET AL.

By their Representatives,

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. Box 2938
Minneapolis, MN 55402
(612) 373-6913

Date

7/2/2002

By

Edward J. Brooks, III
Reg. No. 40,925

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Tina Kohout

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